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XIX.—*On the Alteration which the Atmosphere undergoes during the Development of Heat in the Spadix of Colocasia odora.* By Professors G. VROLIK and W. H. De VRIESE.

[Communicated by the Authors.]

HAVING communicated last year to the first class of the Royal Institute of the Netherlands our experiments regarding the influence of the spadix of *Colocasia odora* on the surrounding atmosphere, we have, in repeating the experiments, constantly obtained the same results with the flowers of this species. Thus convinced that our researches have risen in scientific value, we now subjoin the final result of them.

We used for this experiment the apparatus already described and delineated*, but we did not employ water for closing the gas jar, but mercury, as was also the case with the experiments communicated last year.

We placed the flowers in this apparatus, having previously cut away the greatest part of the spatha, and having varnished the remaining part in such a manner that all evaporation or absorption was prevented, and the green surface could not thus exercise any influence.

We determined the degree of heat in the usual way, but we have not kept our notes on this as fully as before; it not being now so much the object to make this known, as to consider the development of heat, in connexion with the alteration, which, during it, the atmosphere undergoes. For the same reason no account has been given of all the experiments which we have made.

July 9th, 1839.—*Experiment with a plant planted in the open ground in a hot-house.* An idea can scarcely be formed of the vigorous development of the plant treated in this way. Most of the leaves had a petiole of 1.60 Dutch ell (metre) in length. From the union of the petiole with the stem to the apex of the middle nerve, the length was 0.66—0.80 D. ell;

* Tijdschrift voor Nat. Gesch. en Phys. Deel V., p. 139, pl. V.—Ann. des Sc. Nat., 2de Sér., Fevr. 1839.

the breadth at the longest diameter was 0.68. The spadix was nearly as large again as usual.

We must avail ourselves of this opportunity to observe, that we have already (in 1835) declared our opinion regarding the identity of *Colocasia odora* with *Arum cordifolium*, briefly described by Bory de St. Vincent*. This learned gentleman has confirmed in every respect the opinion which we gave in 1835, in our first treatise on the elevated temperature of *Colocasia odora*. Our opinions on that subject were fully given in the French translation of the treatise, which was sent to the Editors of the 'Annales des Sciences Naturelles.' If thus *une faute d'érudition botanique* has taken place, by whomever it may have been, it has not been committed by us†. In Froriep's 'Notizen' of 1836, our treatise was inserted from the 'Tijdschrift voor Natuurlijke Geschiedenis;' and there also the conviction may be obtained, that we had not from the beginning any doubt of the identity of *Colocasia odora* with *Arum cordifolium*. Perhaps at some future period we shall revert to this subject.

After this short digression, we now subjoin the table of our observations on the 9th of July, 1839:—

Hour of Observation.	Temperature of the Spadix.	Temperature of Gas Jar.
A.M. 9 $\frac{3}{4}$	18° C.	18° C.
11	21	18 $\frac{1}{2}$
11 $\frac{1}{2}$	„	„
11 $\frac{3}{4}$	21 $\frac{1}{2}$	„
P.M. 12 $\frac{1}{2}$	22	„
1 $\frac{1}{4}$	23 $\frac{1}{2}$	„
1 $\frac{3}{4}$	„	„
2 $\frac{1}{2}$	23 $\frac{1}{2}$	18
3	22	„
4	21	„

On that day the development of heat gradually decreased, and even on the following day at noon it was scarcely observable for half an hour. The air in the jar was then chemically analysed; oxygen was not found in it, but it was proved that this gas had been replaced by carbonic acid gas.

It is a most remarkable phenomenon, that while the increase of heat had generally been observable for three days, it now nearly ceased on the first day. In our opinion, the disappear-

* Voyage dans les quatre grandes îles de la mer d'Afrique, fait en 1802, II. Paris, 1804, p. 66.

† Vid. l'Institut, Mai 30, 1839, No. 283, p. 184; Sept. 5, 1839, No. 297, p. 312.

ance of oxygen, and its being replaced by carbonic acid gas, was the cause of this ; the quantity of oxygen gas in the jar being once absorbed, the development of heat, losing the stimulus which is indispensably requisite for its existence, must necessarily discontinue.

Judging that by this experiment we have nearly arrived at the right explanation, we think that our former experiments, especially the one of 1838*, concerning the influence of nitrogen on the spadix of the species here alluded to, must be brought into connexion with it. There was *then* no development of heat whatever, the oxygen gas being wanting; *here* it had entirely ceased after a few hours, because all the oxygen gas was absorbed from the atmosphere. On considering this phenomenon, the question readily presents itself,—does the oxygen liberating caloric combine with the carbon contained in the plant to form carbonic acid, and is thus the development of heat, combustion? We are inclined to think so; for when the development of heat has reached its maximum, which is the case in the middle of the day, then also the alteration which the enclosed air undergoes is greatest, as was proved by an experiment we purposely made on the 27th of last June. With this view, we placed at that time in the apparatus, in which a spadix was enclosed, some potash, in order to absorb the carbonic acid in the same ratio in which it was produced. During the time the absorption was taking place, we saw the mercury rise several inches within the space of one hour.

As yet we had made these experiments with the same sort of thermometer we had previously used; but we wished to repeat them with a thermo-electrical apparatus: for this purpose we procured one of M. Becker, philosophical instrument maker in Groningen, who last year, after the flowering of our Colocasias; constructed a most excellent and delicate instrument of this description, with the physiological needles of Becquerel appended to it.

On making these and other experiments, we found, that although the increase of temperature was not quite imperceptible on the second day, yet it was too trifling to attach any particular value to it. On this ground we think we may state, that on the first day all the oxygen gas had not been completely absorbed.

The experiments with the thermo-electrical apparatus, and also all the former ones, were taken in a room of nearly an equal temperature. Either in the dark or in the light the

* Vid. Tijdschr. voor Nat. Gesch. en Physiologie, Deel V., p. 222.

results presented scarcely any remarkable difference. The physiological needle was stuck in the spadix to the depth of one millimetre, which for this purpose was introduced through a copper ball fixed at an opening made in the jar, and moveable in all directions; which apparatus was made with the utmost accuracy by M. E. Wenkebach, philosophical instrument maker at Amsterdam.

The analysis of the atmosphere produced the same results as in the former experiments, viz. the replacing of oxygen gas by carbonic acid gas.

As soon as an opportunity presents itself for the repetition of these experiments, we shall endeavour to maintain the usual proportion of the gases from the atmosphere in the jar, by supplying oxygen gas in the same ratio as it will be found to be absorbed from the enclosed air, and by removing the newly-formed carbonic acid gas.

We do not doubt, that by this mode of proceeding, the elevation of temperature in the spadix of *Colocasia odora* can be kept up the second and third day, and perhaps even to a longer period.

Amsterdam, August 13th, 1840.

XX.—*Note on the Occurrence of the Genus Diphya on the Coast of Ireland.* By G. C. HYNDMAN, Esq., Member of the Natural History Society of Belfast.

WHILST dredging in Belfast Bay on the 6th October, 1838, I had the pleasure of taking in a small towing-net, along with a number of Beroes, a specimen of the remarkable genus *Diphya*, Cuv., the occurrence of which in the British seas is hitherto unrecorded.

With Cuvier's definition of the genus the specimen exactly agreed, as it did with that of Blainville, except that there were no teeth round the aperture of the swimming cavity, as described by the latter author. This appearance instead arose from the extension of the acute ridges by which the body of the animal is formed, and which is indeed shown by the figures in Pl. V. of his 'Actinologie.' Referring for the species to this work, to Eschscholtz's 'System der Acalephen,' to Comte's and to Guérin's 'Illustrations of Cuvier's Règne Animal,' and to Jones's 'Outlines of the Animal Kingdom,' the only works in which I have had the opportunity of seeing the genus represented, I find that my specimen differs in species from all in its more elongated form; I should therefore propose to name it